Course Syllabus

Jump to Today | Edit

BIOC 335/536: Cellular and Molecular Animal Physiology

SYLLABUS Spring 2018

We aim to have you learn mechanisms by which animals solve day to day problems of staying alive; learn skills, strategies, and ways of thinking that are particularly relevant to the study of physiology; and perhaps most important of all, enjoy learning the marvelous phenomena of the animal world.

Meetings:	Tuesdays & Thursdays, 9:25-10:40 AM, Anderson Biological Laboratories (ABL) 126 [NOTE: *No food or beverages permitted in the laboratory classroom.*]
Instructors:	Beth Beason-Abmayr, PhD: ABL 326 (office) / ABL 126 (lab); bbeason@rice.edu (mailto:bbeason@rice.edu) David Caprette, PhD: ABL 327 (office) / ABL 127; caprette@rice.edu (mailto:caprette@rice.edu)
Office Hours:	Dr. Beason: 10-12 MW or by appointment Dr. Caprette: 10:30-12:30 MW or by appointment
Required Resources:	TEXT: *Animal Physiology*, Fourth Edition, Hill et al. (2016) Computer for in-class participation/discussion; access to web, including Canvas

Course Learning Goals and Intended Learning Outcomes

Goal: Acquire a fundamental knowledge of "how animals work"

Learning outcomes

- Demonstrate a working knowledge of mechanisms by which animals function
- Explain how selected physiological mechanisms came to be
- Describe the integration of physiological systems

- Consider interactions between animals and their environments
- Predict possible trade-offs and physiological constraints

Goal: Recognize how prior and new knowledge relate to current/future work

Learning outcomes

- Integrate your knowledge of physiology with new information along with your previous knowledge of biology
- Apply your knowledge and experience to answer questions, solve problems, and investigate case studies in multiple contexts

Goal: Appreciate the importance of animal physiology

Learning outcomes

- Demonstrate a desire to learn more about the mechanisms responsible for animal function
- Relate physiological mechanisms in animal models to the health and disease of non-human animals and animal populations
- Relate physiological mechanisms in animal models to human health and disease

Goal: Understand how to collect, integrate, and communicate information

Learning outcomes

- Acquire information from the primary literature
- Distinguish reliable from unreliable information found on the web
- Critically evaluate information from various sources
- Share new information, ideas, and critiques though written and oral communication

Goal: Exercise responsibility and teamwork

Learning outcomes

- Prepare for class
- Develop ways in which to work effectively within a group
- Communicate openly with your group inside and outside of class
- Engage and actively participate in group work in a constructive manner

Accommodations for students with disabilities

Course material will be delivered either digitally (online or email) or in person and may be visual (written documents, slides, videos, etc.), audio (videos, presentations, discussions), or interactive (questions, discussions, clickers, etc.). Course work will require answering questions online, typing papers, reading written materials, discussing material with peers, taking written exams, and may include light lifting and sitting for extended periods of time. Some interactive portions of lectures will not be available online; thus, students

should choose or request seating where they are best able to view and hear presented materials.

Any student with a documented or suspected disability needing academic adjustments or accommodations is requested to *speak with the instructor in person during the first two weeks of class*; all discussions will remain confidential. Students with disabilities should also contact Alan Russell (**alan.g.russell@rice.edu (mailto:alan.g.russell@rice.edu)**), Director, Disability Support Services (713-348-5841) before the first day of class.

Information contained in this syllabus, other than the absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructors.

Schedule

Dates/due dates for specific deadlines/events are in **blue;** some of these contain links to the assignments in Canvas. Scheduled class activities are in **purple**. Links to or PDFs of assigned research articles and additional assignments and due dates will be posted in Canvas.

Date	TUESDAYS	Date	THURSDAYS
Tues 1/9 Week 1 **Reflection 1**	**Introduction** to the course and group work/contract, exam strategy **Assignment:** Biology Review (Canvas) ***Begin "Food, Energy, and Temperature" (Pt II of text)*** Read Ch. 6 Nutrition, Feeding, and Digestion, pp. 131-141 & 160-163	Thurs 1/11	**Research Article 1** Read Ch. 7 Energy Metabolism, pp. 165-186 **Group Project:** Introduction
Tues 1/16 Week 2	Read Ch. 8 Aerobic and Anaerobic Forms of Metabolism, pp. 189-212 **Research Article 2** **Due: Biology Review: PART I Fundamentals of Physiology (Canvas)**	Thurs 1/18	Read Ch. 9 The Energetics of Aerobic Activity, pp. 215-230 **Research Article 3** **Fictional Animal:** Introduction & 1st Design
Tues 1/23	**Mini Exam 1: 40 min, in-class (Ch.**	Thurs 1/25	Read Ch. 10, pp. 259-281

Week 3	**6-9, 4Qs)** Read Ch. 10 Thermal Relations, pp. 233-259 (Intro, Heat Transfer, Poikilothermy)		(Homeothermy in Mammals and Birds & Warm-Bodied Fish) **Research Article 4** **Due: Project Idea (4%) (Canvas)** **Hand-Out: HW 1: Countercurrent Heat Exchange Mechanisms**
Tues 1/30 Week 4 **Reflection 2**	Read Ch. 11 The Lives of Mammals in Frigid Places, pp. 287-301 **Research Article 5** **Begin Concept Map 1: Part II Food, Energy, and Temperature** **Due: HW 1: Countercurrent Heat Exchange Mechanisms (Canvas)**	Thurs 2/1	***Begin "Oxygen, Carbon Dioxide, and Internal Transport" (Pt V of text)*** Read Ch. 22 Introduction to Oxygen and Carbon Dioxide Physiology, pp. 585-597 **Finish Concept Map 1: Part II Food, Energy, and Temperature** **Hand-out: Group Exam 1 Questions and Research Articles (RA) Exam 1**
Tues 2/6 Week 5	**Mini Exam 2: 40 min, in-class (Ch. 10-11, 4Qs)** Read Ch. 23 External Respiration: The Physiology of Breathing, pp. 599-615 (Intro, Fish, Amphibians, Nonavian Reptiles)	Thurs 2/8	**SPRING RECESS**
Tues 2/13 Week 6	Read Ch. 23 External Respiration: The Physiology of Breathing, pp. 615-626 (Mammals, Birds) **Research Article 6** **Fictional Animal:** 2nd Design **Due: Group Exam 1**	Thurs 2/15	Read Ch. 24 Transport of Oxygen and Carbon Dioxide in Body Fluids, pp. 635-665 **Research Article 7** **Class Activity: Cooperativity in O_2 binding** **Hand-Out: HW 2: Oxygen Affinity, O2 Equilibrium Curves, and Oxygen Carrying Capacity**

Tues 2/20 Week 7 Reflection 3	**Mini Exam 3: 40 min, in-class (Ch. 22-23, 4Qs)** Read Ch. 25 Circulation, pp. 667-679 (Hearts; Pressure, Resistance, and Flow in Vascular Systems) **Fictional Animal:** 3rd & 4th Designs **Due (2/18): RA Exam 1 (Canvas)**	Thurs 2/22	Read Ch. 25, pp. 679-692 (Circulation in Vertebrates) **Research Article 8** **In-class: Fictional Animal work**
Tues 2/27 Week 8	Read Ch. 26 Diving by Marine Mammals, pp. 701-711 (Intro through Circulatory Adjustments during Dives) **In-class: Group Project work** **Assignment: HW 3: The Vertebrate Circulatorium**	Thurs 3/1	Read Ch. 26, pp. 711-718 (Metabolism during Dives, Aerobic Dive Limit, & Decompression Sickness) **Research Article 9** **Due: HW 2: Oxygen Affinity, O2 Equilibrium Curves, and Oxygen Carrying Capacity (Canvas)**
Tues 3/6 Week 9	**Mini Exam 4: 40 min, in-class (Ch. 24, 4Qs)** **Begin Concept Map 2: Part V Oxygen, Carbon Dioxide, and Internal Transport** **Hand-Out: HW 4: Circulation**	Thurs 3/8	**Finish Concept Map 2: Part V Oxygen, Carbon Dioxide, and Internal Transport** **In-class: Fictional Animal work** **Hand-out: Group Exam 2 Questions and RA Exam 2** **Due: HW 3: The Vertebrate Circulatorium, HW 4: Circulation (Canvas)**
Tues 3/13	**SPRING BREAK**	Thurs 3/15	**SPRING BREAK**
Tues 3/20 Week 10	**Mini Exam 5: 40 min, in-class (Ch. 25-26, 5Qs)** **In-class: Group Project work**	Thurs 3/22	**Due: Group Exam 2** ***Begin "Water, Salts, and Excretion" (Pt VI of text)*** Read Ch. 27 Water and Salt

Reflection 4: Fictional Animal & Group Project			Physiology: Introduction and Mechanisms, pp. 723-739 **Research Article 10** **Due: Fictional Animal Question Set 1 (Canvas)** **Fictional Animal:** 5th Design
Tues 3/27 Week 11	**Due (3/25): RA Exam 2 (Canvas)** Read Ch. 28 Water and Salt Physiology of Animals in Their Environments, pp. 741-762 (Animals in Freshwater and in the Ocean & That Face Changes in Salinity) **Research Article 11** **Due: Project Proposal (16%)**	Thurs 3/29	Read Ch. 28, pp. 763-777 (Animals on Land, Control of Water and Salt Balance in Terrestrial Animals) **Research Article 12**
Tues 4/3 Week 12	**Begin Concept Map 3: Part VI Water, Salts, and Excretion** **Mini Exam 6: 40 min, in-class (Ch. 27-28, 4Qs)**	Thurs 4/5	Read Ch. 29, Kidneys and Excretion, pp. 779-788, 802-804, 809-813 (Mechanisms of Kidney Function, Urine Formation in Amphibians and in Other Vertebrates, Nitrogen Disposition and Excretion) **Research Article 13** **In-class: Fictional Animal work**
Tues 4/10 Week 13 **Reflection 5: Group Work**	Read Ch. 29, pp. 788-802 (Urine Formation in Mammals) **Class Activity: Countercurrent Multiplier (CCM)** **Hand-out: HW 5: Countercurrent Multiplier** **Due: Fictional Animal Question**	Thurs 4/12	Read Ch. 30 Mammals of Deserts and Dry Savannas, pp. 815-828 **Finish Concept Map 3: Part VI Water, Salts, and Excretion** **In-class: Fictional Animal work** **Hand-out: Group Exam 3 Questions and RA Exam 3**

	Set 2 (Canvas)		**Due: Fictional Animal Question Set 3 (Canvas)**
Tues 4/17 Week 14	**Group Project Presentations** **Fictional Animal Showcase** **Due: HW 5: Countercurrent Multiplier (Canvas)**	Thurs 4/19	**Group Project Presentations** **Fictional Animal Showcase** **Due: Fictional Animal Question Set 4 (Canvas)**
Date			
Sat 4/28 9am-12pm	**Due: Group Exam 3** **FINAL EXAM: Ch. 29-30 (20%); Cumulative (80%)**	Sun 4/29 11:59 pm	**Due: RA Exam 3 (Canvas)**
Mon 4/30 11:59 pm	**Reflection 6: Overall Course (Canvas)**	Wed 5/2 11:59 pm	**EXTRA CREDIT: Letter to the next class; Cellular and Molecular Animal Physiology Research Article; Integrated Concept Map (Canvas)**

Grading and Policies

You will be graded on an absolute scale by percentage, as in the table. This policy means that you will not be graded relative to the performance of others in your class.

A+	≥ 98		B	83 to < 87		C-	70 to < 73
A	93 to < 98		B-	80 to < 83		D	60 to < 70
A-	90 to < 93		C+	77 to < 80		F	< 60
B+	87 to < 90		C	73 to < 77			

Activity	Grading Criteria	% total
In-Class Mini-Exams and Group Exams	Focused and accurate answers to short answer and essay questions, quantitative and semi-quantitative problems; in-class and out-of-class parts (*see below*)	30
Research Article (RA) Exams	Focused and accurate answers to short answer and essay questions about assigned research articles; out-of-class parts (*see below*)	10
Final Exam	Focused and accurate answers to short answer and essay questions, quantitative and semi-quantitative problems; in-class during scheduled final period (*see below*)	20
Group Project	Each team is to complete a project that is designed to supplement the material that we cover in the course. The team may choose any relevant topic, and the approach to that topic is entirely open-ended (*see below*).	15
Fictional Animal	Each team will be assigned a random, fictional animal and your job as a team is to consider if this animal can survive. In particular, you are interested to determine if its body systems are compatible with each other (*see below*).	15
Engagement & Participation	Individual or team grades based on assessment of participation in group activities and in class discussions and efforts/contributions to in-class and out-of-class assignments. These Formative Assessments include Group Contract, In-class Participation, Reflections, Minute Questions (MQs), Homework, Concept Maps, and Reading Quizzes (*see below*).	10

Policies

This semester we will be conducting a study looking at teaching and learning. The purpose of this study is to determine the factors that influence teaching effectiveness and learning. Your participation in this study will last for the duration of the current semester and will entail activities no different from the regular activities you would otherwise engage in as part of the course. If you would like more information, please do not hesitate to

ask. *If you would like to opt out of the study, please talk to Dr. Beason as soon as possible.*

- **Concept Inventory:** A concept inventory is a multiple-choice tool that assesses a student's conceptual understanding of core concepts in a given subject area. Before the first day of class, you will take a *pre-test* with 20 or so questions to evaluate your background knowledge and uncover possible misconceptions; at the end of the semester, you will take a *post-test* to evaluate whether you understand and can apply some of the key concepts we covered in this course.
- **Course Surveys:** Throughout the semester, Dr. Beason will collect some information about your experiences in this class to help us make this class as productive and effective as possible not only for you but also for future students. The surveys should take 10 minutes or so to complete. The questions are asked one at a time, and you can save your work and return to it later if you are interrupted. Survey results will not be analyzed until after final course grades have been submitted.

In accordance with the **Rice Honor Code**, work on assignments other than those specifically identified as group activities must not be shared with other students. All submitted work must be your own. Information regarding plagiarism is available on the Rice Honor Council website, and all students should be familiar with these guidelines (see additional resources available in the BIOC 335/536 Canvas site).

Attendance policies. We do not directly record attendance, however you must be in class to earn credit for minute questions, concept maps, and in-class group activities and discussions. If you report and document an excused absence (see below) then we will adjust your scores accordingly.

Excused absences. Any absence due to circumstances beyond your control will be excused. You will be responsible for all content covered during the missed class but will not be held responsible for graded in-class activities. We may require documentation such as a note from a physician or a death notice. We may ask for a note from a faculty or staff member who can attest to the necessity of your attending an event in the case of a travel conflict.

Electronics policy. Use of electronics (e.g., computers, tablets, cell phones) during class is *strictly prohibited* unless instructed to do so for a class activity. If you prefer to take notes electronically, please obtain instructor permission to do so. At times when you use a laptop or hand-held device during class to look up information, you should not be surfing the internet, reading e-mail, sending text messages, working on other classes, checking grades, or such.

Late policy. The penalty for late assignments is a deduction of 10% of the total possible score per 24-hour period past the deadline, including weekends and holidays.

Exam policies. You must contact the instructors ***prior*** to any exam if you have an excused absence and will be unable to attend class on the scheduled exam date; we can arrange to have you take the exam at an **earlier** time. We cannot reschedule an exam because you have an exam or a major assignment due in another course on the same day. We cannot give exams after the regularly scheduled time. In the event of illness we will need documentation as explained above. If you miss an exam, and due to circumstances beyond your control you cannot notify us in advance, then you **must** provide documentation in order to make up the credit. At our discretion we will replace the missed exam with an additional assignment (possibly a

different exam) or simply not include the missed exam in determining your final course grade.

Exam content. There are several types of exams in this course: 1) In-Class Mini Exams (20-25 points each): completed in-class during the first 40 minutes of a regular class period; 2) Group Exams (25 points each): completed out-of-class and submitted at beginning of scheduled exam; 3) Research Article (RA) Exams (20-25 points each): timed exams submitted online in Canvas; 4) Final Exam (100 points): completed in-class during the Registrar scheduled final exam period. Mini Exams 1-2, Group Exam 1, and RA 1 Exam will test over all of the concepts and principles covered in the section “Food, Energy, and Temperature.” Mini Exams 3-5, Group Exam 2, and RA 2 Exam will test over “Oxygen, Carbon Dioxide, and Internal Transport.” Mini Exam 6, Group Exam 3, RA 3 Exam will test over “Water, Salts, and Excretion.” The Final Exam will test over Ch. 29 & 30 (20%) and comprehensive knowledge (80%). You are responsible for content covered in class as well as in the textbook and assigned research articles, addressed in group work sessions, and contained in assignments outside of class.

Exam feedback. We do not use “exam graders.” Both instructors will team up to grade each entire exam. We do not split up the grading – rather, we both read each response and agree on a score. Therefore there will be no “regrades” of exams. Although we cannot return exams or post keys, your exam will be available for you to look over when we return it during class or by appointment.

Extra credit. You will have several opportunities throughout this course to earn extra credit. Extra credit may be awarded for exemplary class participation and/or exceptional answers on assignments or exams. BONUS questions may be given on exams. Towards the end of the semester, there will be *optional* extra credit assignments in Canvas.

Additional Information on Activities and Assessments

Group Work. Group work is integral to this course and is a crucial feature of both professional and personal life. Self-reflection, shared discovery, and collective learning are key elements for transforming and elevating the learning experiences of each member of your team. BIOC 335 provides numerous opportunities to explore ways to engage in a group and to discover strategies for effective teamwork. Which strategy will be most effective for an individual to promote optimal group function will vary with the membership and possibly the activity — and key challenges are gathering multiple ways of interacting, figuring out how to "read" the group, and adapting your style to promote group success. *Groups will be assigned on the first day of class and will work together throughout the semester.*

- **Group Project (15% of final grade):** Each team is to complete a project that is designed to supplement the material that we cover in the course. The team may choose any relevant topic, and the approach to that topic is entirely open-ended. For example, you might set up a demonstration, present research, design an experiment, or develop a new teaching strategy. Your project can be anything that broadens the class' knowledge and/or deepens the class’ understanding of a subject related to animal physiology. A one paragraph pre-proposal is to be submitted for instructor approval by Jan 25. The approved pre-

proposal is to be followed by a written proposal with outline/description (*more details to follow*) due on March 27. The final version is to be submitted as a manuscript, poster, PowerPoint presentation, video, etc., during the last week of class, when each team will also give a 15-20 minute presentation. Assignments will be submitted in Canvas and/or turned in during class.

- **Fictional Animal (15% of final grade):** Each team will be assigned a random, fictional animal and your job as a team is to consider if this animal can survive. In particular, you are interested to determine if its body systems are compatible with each other. To help in your analyses, you will have homework assignments followed by class discussions where you can get assistance thinking about your animal. By then, you will have learned about the systems in class. Throughout the semester, you will submit question sets where you 1) explain interactions and function between the different systems; 2) consider adaptive advantages and disadvantages; 3) consider trade-offs in function and efficiency; and 4) consider constraints on physiological processes. In the final assignment, you will 1) name your animal and describe/draw/model what it looks like (*your description may be accompanied by a hand or computerized drawing, but it must be an original image; your animal should not closely resemble an extant animal*) and 2) document whether this animal can exist in the environment you choose as-is or if not, what could be changed so that it can. During the last week of class, you will share the design of your animal.

Engagement & Participation. Many of the assignments and activities you will do throughout this course are formative assessments which are designed to help you learn what you know as well as what you don't know. You will earn participation points for completion of these assessments, which contribute to 10% of your overall course grade. More importantly, you will receive detailed feedback from us to help you improve your learning.

- **Group Contract:** Working effectively in a group requires commitment to the group and respect for each member of the team. Recognizing both positive and negative group behaviors in ourselves and in each other promotes strong group dynamics. To promote positive group interactions, you will work with your team to prepare a draft, and as a class we will create a consensus Group Contract that each student will sign and adhere to for the course of the semester.
- **In-class Participation**: The effectiveness of the group process and discussion during class will be assessed using the following Self-Graded Participation Rubric. This assessment is worth 2 points each class period; you will write your name and self-evaluation on a card and turn in at the end of class. *NOTE: you must attend class to earn these points.*

1. My communication with group members was open and supportive; our group worked together effectively	Not At All (0 pt)	Somewhat (0.5 pt)	Yes (1.0 pt)
2. I was engaged and actively participated in group work in a constructive manner; I contributed to discussions based on assigned reading	Did Not Contribute (0 pt)	One to Two Contributions (0.5 pt)	Multiple Contributions (1.0 pt)

- **Reflections.** Your first reflection will be due by the first day of class. Throughout the semester, a reflection will be due in Canvas at the beginning of class on the indicated dates that states clearly what you found to be most interesting or challenging in the material since the last Reflection and *why*. These reflections can address what you didn't know previously and find interesting, what impact something you learned has on your own perceptions, what long-term implications a specific discovery/piece of information has on you/on society….whatever was important to you about the material covered. Some reflections associated with specific assignments (e.g., the Group Project and Fictional Animal) may ask you specific questions about the assignment and what/how you learned. *Reflections will be submitted in Quizzes in Canvas.*
- **Minute Questions (MQ).** These short quizzes, which may be unannounced, will be given at the beginning of the class period *over the assigned material for that class*. You are expected to complete the assigned readings in Hill *et al.*, to read assigned research articles, and to view any relevant videos and/or online resources BEFORE CLASS. We will provide blank note cards for your short answers, which we will collect in class. There will be at least 10 minute questions throughout the semester. You will earn 2 completion points for each MQ that you answer and will receive feedback from us about your response. *NOTE: you must be present to earn these points.*
- **Homework:** These questions, worksheets, or problems are designed so you can apply what you learn in readings and discussions to explore concepts in more depth, especially those that are more challenging to understand. While you submit homework individually, we often allow you to discuss the assignment as a team.
- **Concept Maps:** Each team will create a concept map for each major unit we cover from the textbook. You will build your construct map during one or more class periods. This activity will help you review what you know and identify what you don't know and provides a visual representation of the integrative nature of physiology.
- **Reading Quizzes:** Throughout the course, there will be "Just in Time" quizzes, which are based on the assigned readings in the textbook and/or research articles. Each short quiz is designed to
  - emphasize key concepts
  - uncover possible misconceptions
  - gauge what you do / don't know
  - prepare you for class discussions

  Although we will not ask you multiple choice questions on exams, reviewing the incorrect as well as the correct answers as you study will help you evaluate your understanding of key concepts. We encourage you to think about applications of these concepts and ask yourself additional questions to test yourself.

  The quiz will open at 9 pm the night before class and close at 9 am the morning of class. <u>You will have 15 minutes to answer 3-5 multiple choice questions</u>. *It is essential that you read and study the chapter before taking this quiz as you may not be able to "look-up" the correct answer in the reading.*

ADDITIONAL ASSIGNMENTS FOR GRADUATE STUDENTS. As you probably know, an institution's post-baccalaureate degree programs, including master's and doctoral degree programs, should be more advanced in academic content than the corresponding undergraduate degree programs. In BIOC 536 we meet this criterion by incorporating the following assignments into the course grade in addition to the worksheets, reflections, group work, and exams that are required of undergraduates in BIOC 335.

Reading Guides (Assigned to RA Exams). For each exam period, you will prepare a reading guide for a recent journal article that is relevant to one of the topics covered in that period. The articles will be primary literature that reports findings from original research, authored by the original investigators, and peer-reviewed. You are asked to read the article thoroughly and prepare a reading guide similar to the guides provided to the class for the articles. Please prepare your guides using the Microsoft Word template in Files and upload each guide into Canvas by the specified due date/time. In addition to the full citation, each guide should include a list of terms to review and a minimum of five questions including at least two background questions, at least two paper-specific questions, and at least one Talmudic question, all to fit on one page. Please add a page break and on the second page provide explanations of terms and suggested answers to the questions (sort of an answer key). We will use your guides in future semesters.

Discussion Leader (Assigned to Engagement & Participation). At least once during the semester, you will be the "expert" on the assigned research article for that day and will help lead the class discussion, thus giving you opportunities to gain further teaching experience. In the first week of classes, you will “draw numbers” to find out the order; dates will be announced later.

Course Summary:

Date	Details	
Wed Jan 10, 2018	Concept Inventory: Pre-test (https://canvas.rice.edu/courses/9953/assignments/56723)	due by 11:59pm
	Reflection 1 (https://canvas.rice.edu/courses/9953/assignments/56518)	due by 11:59pm
Thu Jan 11, 2018	MQ 1 (https://canvas.rice.edu/courses/9953/assignments/56546)	due by 9:30am
Tue Jan 16, 2018	Hill Ch 8 Reading Quiz (https://canvas.rice.edu/courses/9953/assignments/63295)	due by 9am
	Biology Review: PART I Fundamentals of Physiology (https://canvas.rice.edu/courses/9953/assignments/56515)	due by 11:59pm
Thu Jan 18, 2018	Group Contract	due by 11:59pm

	(https://canvas.rice.edu/courses/9953/assignments/56721)	
Tue Jan 23, 2018	Mini Exam 1 (https://canvas.rice.edu/courses/9953/assignments/56543)	due by 10:05am
Thu Jan 25, 2018	Project Idea (4%) (https://canvas.rice.edu/courses/9953/assignments/56556)	due by 9:25am
Tue Jan 30, 2018	HW 1: Countercurrent Heat Exchange Mechanisms (https://canvas.rice.edu/courses/9953/assignments/56539)	due by 9:25am
Thu Feb 1, 2018	Concept Map 1: Part II Food, Energy, and Temperature (https://canvas.rice.edu/courses/9953/assignments/56525)	due by 11:59pm
Tue Feb 6, 2018	Mini Exam 2 (https://canvas.rice.edu/courses/9953/assignments/56726)	due by 10:05am
Tue Feb 13, 2018	Group Exam 1 (https://canvas.rice.edu/courses/9953/assignments/56537)	due by 9:25am
Thu Feb 15, 2018	Reflection 2 (https://canvas.rice.edu/courses/9953/assignments/56513)	due by 11:59pm
Sun Feb 18, 2018	RA Exam 1 (https://canvas.rice.edu/courses/9953/assignments/58029)	due by 11:59pm
	RA Exam 1b (https://canvas.rice.edu/courses/9953/assignments/61676)	due by 11:59pm
Tue Feb 20, 2018	Mini Exam 3 (https://canvas.rice.edu/courses/9953/assignments/56727)	due by 10:05am
Thu Mar 1, 2018	HW 2: Oxygen Affinity, O2 Equilibrium Curves, and Oxygen Carrying Capacity (https://canvas.rice.edu/courses/9953/assignments/56540)	due by 11:59pm
Tue Mar 6, 2018	Mini Exam 4 (https://canvas.rice.edu/courses/9953/assignments/56730)	due by 10:05am
Thu Mar 8, 2018	Concept Map 2: Part V Oxygen, Carbon Dioxide, and Internal Transport (https://canvas.rice.edu/courses/9953/assignments/56527)	due by 11:59pm
	HW 3: The Vertebrate Circulatorium (https://canvas.rice.edu/courses/9953/assignments/56520)	due by 11:59pm
	HW 4: Circulation (https://canvas.rice.edu/courses/9953/assignments/56541)	due by 11:59pm

Tue Mar 13, 2018	Reflection 3 (https://canvas.rice.edu/courses/9953/assignments/56519)	due by 11:59pm
Tue Mar 20, 2018	Mini Exam 5 (https://canvas.rice.edu/courses/9953/assignments/56729)	due by 10:05am
Thu Mar 22, 2018	Group Exam 2 (https://canvas.rice.edu/courses/9953/assignments/56724)	due by 9:25am
	Fictional Animal Question Set 1 (https://canvas.rice.edu/courses/9953/assignments/56530)	due by 11:59pm
Sun Mar 25, 2018	RA Exam 2b (https://canvas.rice.edu/courses/9953/assignments/61677)	due by 11:59pm
	RA Exam 2 (https://canvas.rice.edu/courses/9953/assignments/58030)	due by 11:59pm
Tue Mar 27, 2018	Project Proposal (16%) (https://canvas.rice.edu/courses/9953/assignments/56558)	due by 9:25am
Tue Apr 3, 2018	Mini Exam 6 (https://canvas.rice.edu/courses/9953/assignments/56728)	due by 10:05am
Tue Apr 10, 2018	Fictional Animal Question Set 2 (https://canvas.rice.edu/courses/9953/assignments/56531)	due by 11:59pm
Thu Apr 12, 2018	In-class participation (https://canvas.rice.edu/courses/9953/assignments/56722)	due by 11am
	Concept Map 3: Part VI Water, Salts, and Excretion (https://canvas.rice.edu/courses/9953/assignments/56526)	due by 11:59pm
	Fictional Animal Question Set 3 (https://canvas.rice.edu/courses/9953/assignments/56532)	due by 11:59pm
Tue Apr 17, 2018	Project Presentation (40%) (https://canvas.rice.edu/courses/9953/assignments/56557)	due by 9:25am
	Fictional Animal Question Set 4 (https://canvas.rice.edu/courses/9953/assignments/56533)	due by 11:59pm
	HW 5: Countercurrent Multiplier (https://canvas.rice.edu/courses/9953/assignments/56542)	due by 11:59pm
Thu Apr 19, 2018	Final Product (40%) (https://canvas.rice.edu/courses/9953/assignments/56534)	due by 11:59pm
	Reflection 4: Fictional Animal & Group Project	due by 11:59pm

	(https://canvas.rice.edu/courses/9953/assignments/56514)	
Sat Apr 28, 2018	Group Exam 3 (https://canvas.rice.edu/courses/9953/assignments/56725)	due by 9am
	Final Exam (https://canvas.rice.edu/courses/9953/assignments/56544)	due by 12pm
Sun Apr 29, 2018	RA Exam 3 (https://canvas.rice.edu/courses/9953/assignments/58031)	due by 11:59pm
	RA Exam 3b (https://canvas.rice.edu/courses/9953/assignments/61678)	due by 11:59pm
Mon Apr 30, 2018	Reflection 5: Group Work (https://canvas.rice.edu/courses/9953/assignments/56516)	due by 11:59pm
	Reflection 6: Overall Course (https://canvas.rice.edu/courses/9953/assignments/56517)	due by 11:59pm
Wed May 2, 2018	Integrated Concept Map (https://canvas.rice.edu/courses/9953/assignments/57986)	due by 4pm
	Cellular and Molecular Animal Physiology Research Article (https://canvas.rice.edu/courses/9953/assignments/56528)	due by 11:59pm
	Letter to the next class (https://canvas.rice.edu/courses/9953/assignments/56529)	due by 11:59pm

- BIOC 335/536 Cellular and Molecular Animal Physiology: Mid-Course Survey (https://canvas.rice.edu/courses/9953/assignments/58004)
- BIOC 335/536 Cellular and Molecular Animal Physiology: Post-Course Survey (https://canvas.rice.edu/courses/9953/assignments/58005)
- BIOC 335/536 Cellular and Molecular Animal Physiology: Pre-Course Survey (https://canvas.rice.edu/courses/9953/assignments/57987)
- Concept Inventory: Post-test (https://canvas.rice.edu/courses/9953/assignments/58007)
- Hill Ch. 9 Reading Quiz (https://canvas.rice.edu/courses/9953/assignments/63314)
- MQ 10 (https://canvas.rice.edu/courses/9953/assignments/56547)
- MQ 2 (https://canvas.rice.edu/courses/9953/assignments/56548)
- MQ 3 (https://canvas.rice.edu/courses/9953/assignments/56549)
- MQ 4 (https://canvas.rice.edu/courses/9953/assignments/56550)
- MQ 5 (https://canvas.rice.edu/courses/9953/assignments/56551)
- MQ 6 (https://canvas.rice.edu/courses/9953/assignments/56552)

- MQ 7 (https://canvas.rice.edu/courses/9953/assignments/56553)
- MQ 8 (https://canvas.rice.edu/courses/9953/assignments/56554)
- MQ 9 (https://canvas.rice.edu/courses/9953/assignments/56555)